



marked-up

Asymmetrically steering rolling device

BACKGROUND OF THE INVENTION

This invention relates to steered rolling devices, for
5 example roller skates, multi tracked skates, skis on wheels.

As far as the mentioned rolling devices are to be steered by
leaning sideways they steer the same way on either side.

The state of the art is for example shown by

10 ~~DE10060663C1~~ US6,755,425 ~~(or EP1213043B1)~~, which discloses a
steering mechanism containing two wheels guided by a
laterally oriented closed parallelogram or trapezium ~~fourfold~~
~~linked-chain~~ fourbar linkage. FIG. 1 shows the state-of-the-
art steering mechanism. Part of the frame 20 is cut away so
15 that the steering mechanism can be seen. FIG. 1 shows
horizontal cross-guides 13, 14, which are rotatably secured
to extensions 8 of the frame 20, the axes of rotation being 2
and 2a. In order to provide the rotation around axis 2 two
spherical bushings 15, 16 are used; in order to provide
20 rotation around axis 2a one spherical bushing 17 is used. The
contour of the boot is indicated.

A pair of rolling devices is attached to the two legs of the
skater. Upon slaloming, in particular when skating along a
25 circle, both legs perform tracks with equal curvature, which
are offset by the legs' distance. Hence one track crosses the
other so that parallel skating is disturbed eventually
causing the skater to fall down and suffer injury. This
interference can be avoided by using technical means, which
30 let the outer skate perform a wider curve than the inner
skate.

DE10135481A1 discloses one solution to the problem insofar as
two fixed wheels oriented one behind the other providing a
35 lateral offset so that upon leaning to one side the first

wheel has contact to the ground, upon leaning to the other side, the second wheel has contact to the ground. Hence turning left provides a wheel-base which is different from the wheel-base when turning right providing the desired
5 difference between the left curve radius and the right curve radius. However this solution is disadvantageous, as when turning left or right either the one or the other wheel lifts from the ground which results in a bad tracking behaviour. Furthermore the wheels suffer from asymmetric wear. Therefore
10 it is desirable that the asymmetric steering is intrinsically provided by the steering mechanism itself.

BRIEF SUMMARY OF THE INVENTION

The purpose of the invention therefore is to design the
15 steering mechanism in a way that the steering effect generated by the sideways leaning to the left is different from the steering to the right.

Based on the known rolling device to be used on the ground
20 which is symmetrically steered by leaning sideways,
consisting of an upper boot, a frame attached to the upper
boot and at least one steering mechanism, the steering
mechanism consisting of one pair of wheels oriented side by
side, wherein the two wheels are rotatably affixed to two
25 wheel holders and wherein the two wheel holders are pivotably
interconnected using an upper horizontal cross-guide and a
lower horizontal cross-guide so that a parallelogram or
trapezium-like closed fourbar linkage results, wherein the
two horizontal cross-guides are rotatably affixed each to the
30 frame, wherein the direction of the rotation axes makes a
solid angle alpha with the direction of the pivot axes of the
closed fourbar linkage, wherein the two cross-guides and the
frame have bore-holes which accommodate axles, bearings or
spherical bushings allowing rotation around the said rotation
35 axes, rolling device which steers by leaning sideways,

comprising at least one pair of wheels oriented side by side, wherein the two wheels 1a, 1b of the wheel pair are rotatably affixed to two wheel holders 18a, 18b and wherein the two wheel holders are pivotably interconnected using an upper
5 horizontal cross-guide 13 and a lower horizontal cross-guide 14 so that a parallelogram or trapezium-like closed fourfold linked chain results, wherein the two horizontal cross-guides 13, 14 are rotatably affixed each to at least one extension 8 of the frame 20 of the rolling device, wherein the direction
10 of the rotation axes 2, 2a makes a solid angle alpha with the direction of the pivot axes of the fourfold linked chain, wherein the two cross-guides 13, 14 and the at least one extension 8 have bore holes which accommodate axles, bearings, spherical bushings or the like allowing rotation
15 around the said rotation axes 2, 2a, the purpose of the invention is now achieved by the said bore-holes being positioned so that the vertical projection of the said rotation axes onto the ground each make a solid angle beta beyond zero to the vertical projection of the pivot axes of
20 the closed fourbar linkage onto the groundthe said rotation axes 2, 2a each make a solid angle beta to the plane which is defined by being perpendicular to the wheels' axes 7 and by being located in the middle of the distance between the two wheels 1a, 1b of the wheel pair.

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 2 shows details of the invented asymmetrically steering mechanism as seen from the bottom, disclosing the solid angle beta extending between the vertical projection of axis 2 and
30 the vertical projection of the middle line which is assumed here to be parallel to the four pivot axes of the closed fourbar linkage, the middle line appearing plane which appears projected as the line 3 in FIG. 2(b).

FIG. 2(a) shows the steering mechanism as seen from the
35 front, omitting one extension 8.

FIG. 2(c) shows the upper cross-guide 13 as seen from behind.

DETAILED DESCRIPTION OF THE INVENTION

In particular it is shown (FIG. 2(b)) that the spherical
5 bushings 15, 16 from the upper horizontal cross-guide 13 are
located diagonally off-center with respect to the ~~vertical~~
~~middle plane~~middle. It can also be seen that the spherical
bushing 17 from the lower cross-guide is located off-center
with respect to the ~~vertical middle plane~~middle.

10

Spherical bushings need not necessarily be used. A person
familiar with the art may use other technical means like axle
bore-holes and axles or the like in order to provide the
cross-guides with the capability of rotation with respect to
15 the extensions 8 of the frame, given that the axis of
rotation has the position and the direction as disclosed in
this invention.

It is desirable that the two wheels 1a, 1b carry equal loads
20 at any lean angle. This is achieved by having the axes 2, 2a
intersect the vertical middle plane in points M, M2, where
the intersection points M, M2 are located on the vertical
line 19 through the wheel axis 7. The vertical middle plane
is defined by being perpendicular to the wheels' axes 7 and
25 being located centrally between the two wheels 1a, 1b.

The angle beta turns out to be proportional to the angle
alpha squared and proportional to the desired difference
between the two curvatures, i.e. the legs' distance, and to
30 be inversely proportional to the wheel-base. This relation
can be derived easily by considering the geometry of the
invented system. This invention allows many combinations of
the angles alpha and beta, as required by the type of
intended application.

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I claim

a rolling device to be used on the ground which is
asymmetrically steered by leaning sideways, consisting of an
5 upper boot or boot mounting device, a frame attached to the
upper boot and at least one steering mechanism, the steering
mechanism consisting of ~~having at least one~~ pair of wheels
oriented side by side, wherein the two wheels ~~of the wheel~~
~~pair~~ are rotatably affixed to two wheel holders and wherein
10 the two wheel holders are pivotably interconnected using an
upper horizontal cross-guide and a lower horizontal cross-
guide so that a parallelogram or trapezium-like ~~closed~~
~~fourfold-linked chain~~ closed fourbar linkage results, wherein
the two horizontal cross-guides are rotatably affixed each to
15 ~~at least one extension of the frame of the rolling device,~~
wherein the direction of the rotation axes makes a solid
angle α with the direction of the pivot axes of the
~~fourfold-linked chain~~ closed fourbar linkage, wherein the two
cross-guides and the ~~at least one extension~~ frame have bore-
20 holes which accommodate axles, bearings or, spherical
bushings ~~or the like~~ allowing rotation around the said
rotation axes, the said bore-holes being ~~new~~ positioned so
that the vertical projection of the said rotation axes onto
the ground each make a solid angle β beyond zero to the
25 vertical projection of the pivot axes of the closed fourbar
linkage onto the ground ~~the plane which is defined by being~~
~~perpendicular to the wheels' axes and by being located in the~~
~~middle of the distance between the two wheels of the wheel~~
pair.

30

Abstract

The two skates steered by leaning sideways normally curve along circles of similar curvature. As the two circles are offset by the legs' distance they intersect. In order to avoid this disadvantage it is desirable that the outer leg's curved track has a larger radius than the inner leg's curved track. Using lean-controlled steered skates with tiltable wheels comprising a parallelogram ~~fourfold-linked chain~~closed fourbar linkage including two horizontal cross-guides the purpose is achieved by affixing the two cross-guides rotatably to extensions of the frame in such a way that the vertical projection of the rotation axis makes a solid angle with the vertical projection of the pivot axes of the closed fourbar linkage~~middle plane~~.